NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

Leaf stage and controlling glyphosate-resistant tall fleabane

By Bhagirath S. Chauhan[1]

AT A GLANCE...

- A population of tall fleabane has been found highly resistant to glyphosate.
- Herbicides provided better control when applied at the four-leaf stage of tall fleabane (compared to 14-leaf stage).
- Saflufenacil was the most effective herbicide and could be included in the double knock herbicide option.
- Control herbicide-resistant populations at an early stage.

TALL fleabane (*Conyza sumatrensis*) is an erect annual broadleaf weed species, which can reach up to two metres in height. It has a tap root system. The flowers are greenish white, which produce fluffy seeds. Seeds are spread by wind, which makes it hard to implement management strategies.

Tall fleabane is a major weed of fallows and competes for soil moisture in fallow as well as crops. Recently, glyphosate and paraquat resistant biotypes have been reported from the northern region of Australia. Such resistance reports suggest that there is a need to evaluate performance of different herbicides for the control of fleabane. Generally, herbicide efficacy is reduced when applied on large weed plants.

But such information is not available for tall fleabane. This article reports on research to evaluate the efficacy of different post-emergent herbicides on tall fleabane when applied at 4 and 14-leaf stages.

Bhagirath Chauhan with tall fleabane in the background. Weed growth stage is very important when applying herbicides.

What was done?

A suspected glyphosate-resistant population of tall fleabane was collected from a fallow field near Dalby. Two pot experiments were conducted in the weed science screenhouse facility of the University of Queensland, Gatton. Pots (20 cm diameter) were filled with potting mix and seeds were planted on the soil surface. After emergence, 8 plants were kept per plot.

Herbicides were applied using a Research Track Sprayer that delivered 108 litres per hectare spray solution. TeeJet

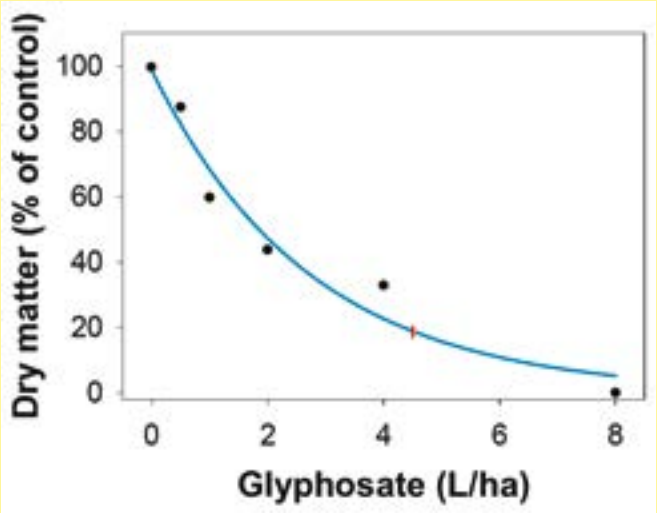
110015 nozzles were used in the sprayer. At three weeks after application, plant survival was assessed with surviving plants harvested and oven dried for three days at 70ºC for dry matter determination.

Survival and dry matter data were converted to a percentage of the non-treated control treatment.

Experiment I

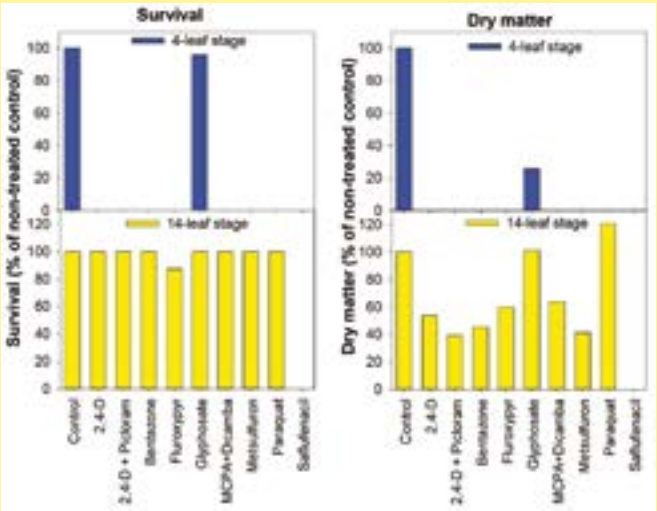
To evaluate the resistance level, tall fleabane plants were sprayed with glyphosate at the four to five leaf stage. Glyphosate (450 g/L) rates were 0.5, 1.0, 2.0, 4.0 and 8 litres per hectare. There was a non-treated (0 litres per hectare glyphosate) control treatment. Each treatment was replicated three times.

FIGURE 1: Effect of glyphosate (L/ha) dose on the dry matter reduction (% of the non-treated control treatment) of tall fleabane



The blue and red lines show the doses required to reduce 50 and 80 per cent dry matter (versus non-treated control).

FIGURE 2: Effect of different herbicide treatments on survival (% of the non-treated control treatment) and dry matter (% of the non-treated control treatment) of tall fleabane when applied at four-leaf (blue bars) and 14-leaf stage (yellow bars)



Experiment II

In this experiment, tall fleabane plants were sprayed with different (registered and unregistered) herbicide treatments at 4 (3 cm in diameter) and 14-leaf (12–14 cm in height) stages. Herbicide treatments and their doses are shown in Table 1. There was a non-treated control treatment for each leaf stage.

What was found?

Experiment I

The tall fleabane population was found highly resistant to glyphosate (Figure 1). About 95 per cent of plants survived the rate of 4 litres per hectare glyphosate. A rate of 1.8 litres per hectare glyphosate was required to reduce 50 per cent dry matter of the non-treated control plants. To reduce 80 per cent dry matter, glyphosate at 4.3 litres per hectare was required.

Experiment II

More than 95 per cent of plants survived following the application of glyphosate at the four-leaf stage (Figure 2). But the dry matter of the glyphosate treated plants was only 26 per cent of the non-treated control treatment. These results suggest that the treated plants survived the herbicide application but their growth was suppressed. Other herbicides applied at the four-leaf stage had no surviving plants.

The results were very different when herbicides were applied at the 14-leaf stage. Only saflufenacil provided 100 per cent kill of the plants. Fluroxypyr-treated pots had 88 per cent plant survival and other herbicides had 100 per cent survival. At this stage, metsulfuron and 2,4-D + picloram provided about 60 per cent reduction in the dry matter. Glyphosate and paraquat did not provide any suppression in the dry matter.

This tolerance to most herbicides might be due to the ability of the plants to rapidly metabolize the herbicides.

To sum up

The results of this study clearly highlight the importance of leaf stage when applying herbicides. Growth stage becomes very critical when the target is a glyphosate-resistant weed. The 4-leaf stage was found most susceptible to the tested herbicides.

But in a field situation, it is very difficult to spray herbicides at or before this leaf stage. So there is a need to evaluate the effect of increased herbicide rates, herbicide mixtures and double knock herbicides. Saflufenacil (Sharpen) was the most effective herbicide. This herbicide could be included as a potential second knock option for the control of tall fleabane.

1. Associate Professor, QAAFI, University of Queensland, Gatton. ■

TABLE 1: Herbicide treatments used in the study

No.	Treatment	Rate/ha
1	Control	—
2	Amicide Advance 700 (2,4-D)	1.5 L
3	Tordon 75-D (2,4-D + picloram)	1.0 L
4	Basagran (bentazone)	2.0 L
5	Starane Advanced (fluroxypyr)	0.3 L
6	Glymount (glyphosate)	1.5 L
7	Kamba M (MCPA + dicamba)	1.0 L
8	Associate (metsulfuron methyl)	5 g
9	Nuquat 250 (paraquat)	2.0 L
10	Sharpen (saflufenacil) + 1% Hasten	12 g

Dry weather doesn't deter crown rot management

MANAGING crown rot has become virtually second nature to growers in northern New South Wales and Queensland over the past 10 years.

It's a risk most growers now routinely factor into key management decisions on crop and variety selection, sowing time and planting configuration in a bid to avoid potential yield losses which can be more than 50 per cent if not managed.

The crown rot fungi are stubble borne fungal pathogens that can affect all winter cereals by restricting the flow of water and nutrients to developing heads when moisture or heat stress occurs during the critical grain filling stage. This can result in pinched grain or heads with no grain – otherwise known as 'whiteheads'.

Dry conditions in 2018 heralded a significantly smaller wheat and barley plant with generally reduced biomass and yield production. But experts are still expecting most growers to remain on crown rot alert in recognition that vigilance is the key to management over the longer term.

NSW Department of Primary Industries (DPI) senior plant pathologist Dr Steven Simpfendorfer said crown rot inoculum levels were a function of biomass/number of tillers produced, both of which tended to be reduced in a dry year, and the percentage of plants infected by the pathogen. Hence, inoculum levels, while not increasing as much as in a wetter year, are still maintained in lower yielding cereal crops in drier seasons.

"A potentially bigger issue in a dry year is reduced stubble decomposition due to lack of moisture which restricts displacement of crown rot inoculum, especially in standing cereal stubble, even if a break crop was grown in 2018," Steven said.

"Effective crown rot management is a long term commitment. It hinges on using a combination of tactics including break crops to reduce inoculum levels in paddocks, inter-row sowing to limit infection levels, fallow management, cereal crop and variety choice, sowing time and addressing other sub-soil or soil-borne constraints such as sodicity and root lesion nematodes.

"So, it's important that growers remain vigilant and opt for Predicta B testing ahead of this year's winter crop plant so they can make informed decisions about crop and variety selections and tweak their longer term disease management programs if necessary."

Predicta B is a DNA-based soil test that has been successfully used by growers and advisers for years to assess crown rot inoculum levels and guide crop/variety and paddock selection, long term disease management and the identification of other soil-borne diseases or root lesion nematode issues.

NSW Department of Primary Industries (DPI) senior plant pathologist Dr Steven Simpfendorfer is encouraging growers to undertake Predicta B testing ahead of the winter crop plant so they can make informed decisions about crop and variety selections and tweak their longer term disease management programs if necessary. (PHOTO: GRDC)

Continually evolving

The testing is continually evolving to support growers across different regions. A test for inoculum levels related to Ascochyta blight of chickpeas and two tests for beneficial Arbuscular Mycorrhizal Fungi (AMF), which when at low numbers cause long-fallow disorder, were added to the northern region options in 2018.

It's an important research investment for the GRDC and is commercially available to growers through the South Australian Research and Development Institute (SARDI).

Testing soil samples with added stubble/plant residue before planting is the most effective way to assess the risk of crown rot within individual paddocks.

For results to be accurate, Predicta B requires a dedicated sampling strategy and is not a simple add on to a soil test.

Sampling recommendations:

- Collect two cores of one centimetre diameter and 15 centimetres deep from each of 15 different locations within the target paddock or production zone.
- Samples may be taken to a depth of 30 cm if growers are concerned about *Pratylenchus thornei* detection.
- If using a larger diameter core or coring to 30 cm, take fewer cores per location.
- Take soil cores from along/in the rows of the previous cereal crop if still visible and retain any stubble collected by the core. Most soil-borne pathogens are concentrated under the rows of the last cereal crop.
- If the rows cannot be seen, take the cores at random.
- Add two pieces of cereal stubble (or grass weed), if present, to the sample bag at each of the 15 sampling locations to improve the detection of crown rot.
- Each piece should be a single dominant tiller from the base of different plants and include the crown to the first node. Discard material from above the first node.
- Maximum sample weight should not exceed 500 grams.

Crown Analytical Services (CAS) is the service co-ordinator for the northern region Predicta B test and can provide northern growers and advisors with bags, soil corers, protocols and procedures for sampling as well as an interpretation of results once tests are completed.

Predicta B kits can be obtained from CAS by contacting 0437 996 678 or email crownanalytical@bigpond.com or for more information on the Predicta B tests visit the SARDI website *www.pir.sa.gov.au* ■

Quantifying nutrient removal this harvest

By Bede O'Mara, agronomist, Incitec Pivot Fertilisers

A NUMBER of (fortunate) growers are now harvesting summer crops in northern New South Wales and Queensland, after another tough summer cropping season.

While it is not traditionally a time to consider nutrition plans, harvest time does present an easy opportunity to get some valuable data. Not by soil testing – which is unlikely to provide insights yet for the next crop when soil moisture levels are so low – but by grain nutrient testing.

Grain nutrient testing helps growers extract information from their crop that may be used to better quantify nutrient removal from the paddock, assess the performance of their summer crop nutrient program and start to plan fertiliser programs for the coming season.

Nutrient testing is available on all grains and is a simple way to get a head start on future seasons.

Growers and advisers have been using yield results for many years to estimate nutrient removal, but these rely on average removals. But it is difficult for published averages for grain nutrient removal numbers to be meaningful for crop nutrition programs, especially when the seasons have been anything but average.

Consider the differences in yield, grain quality and nutrient levels seen in these grain tests after three different years in crops on trials sites at the Darling Downs, western Downs and in northern NSW (Table 1).

The nitrogen, phosphorus, potassium and zinc values have varied due to the seasonal conditions and protein, while the sulphur levels have been fairly consistent over the years.

The sorghum grain test results revealed wide variations in nutrient removal levels depending on the season.

It might be easy to just use an average figure and assume that 18 kg of nitrogen is being removed per tonne of sorghum grain, but grain test results (Table 1) show the actual nitrogen removal figure could be up to 100 per cent higher.

Grain nutrient tests have also revealed that the rate of potassium

Given the string of wildly variable seasons over the past 24 months, Bede O'Mara, agronomist with Incitec Pivot Fertilisers, says the best way to manage nutrition is by gathering some hard data from grain nutrient tests and soil tests.

TABLE 1: Sorghum grain nutrient test results from trial sites in northern NSW and southern Queensland

	Trial data	2017–18	2016–17	2015–16	Published data	
	Mean grain yield (t/ha)	*4.56*	*7.52*	*3.15*	**Average removal***	**Range**
	Grain protein %	*13.9*	*11.6*	*14.5*		
N	(kg N/t grain)	36.6	18.6	23.2	18.0	9–26
P	(kg P/t grain)	4.0	5.6	2.9	3.4	1.4–4.0
K	(kg K/t grain)	10.3	6.0	7.3	3.3	2.6–4.1
S	(kg S/t grain)	2.1	2.2	2.0	2.4	0.9–3.2
Zn	(grams Zn/t grain)	53.0	49.5	47.0	Up to 72	13–24

Source: Data from Incitec Pivot Fertilisers' trial sites. Grain tests conducted by Nutrient Advantage laboratory.
*Sourced from Pacific Seeds Nutrition Booklets (2015), More Profit from Crop Nutrition (2015), Australian Soil Fertility Manual (2000), Incitec Pivot Fertilisers' data (unpublished).

removal from the sorghum trials has been much higher than the recognised published average of 3.3 kg of potassium per tonne of grain, at between 6 and 10 kg of potassium per tonne of grain.

The phosphorus results show instances of both higher and lower phosphorus removal than the recognised average of 3.4 kg of P per tonne of sorghum grain.

Start grain testing this season

Before embarking boots and all into the next fertiliser application season, it's a good idea to grain test at harvest. Grain testing is as simple as collecting 400 grams of harvested grain from the header, truck or silo and submitting it to the Nutrient Advantage laboratory for analysis.

You may wish to take samples from different summer crop species, or from numerous varieties or hybrids of the same species. Even comparing short and long fallow paddocks is likely to unearth some useful differences. Local data is always the best.

By combining this information with yield results you can calculate actual nutrient export data by crop species, paddock or hybrid/variety. This provides a very useful base for the next crop's fertiliser planning.

Consider running nutrient budgets based on previous soil tests, overlaying paddock history and fertiliser applications to estimate how much is left.

Soil testing is still critical, but wait for rain

Of course, a robust crop nutrition program should still include regular soil testing. This is best undertaken after some moisture recharges the soil profile. Consider soil sampling midway through the fallow to see where nutrient levels of individual paddocks are sitting in relation to critical values for the intended crop.

Full profile samples for nitrogen and sulphur can be taken again later in the fallow, when moisture has built up. This provides a more accurate picture of both the quantity of nitrogen and sulphur in the profile and its position. Soil testing paddocks with 50–60 per cent water filled pore space allows nitrogen budgets to be more reliant on fact, and less reliant on mineralisation assumptions. Application strategies can be fine-tuned from previous pre-plant applications.

Soil samples should be taken to the anticipated crop's rooting depth, with three to four segments such as 0–10 cm, 10–30 cm, 30–60 cm and 60–90 cm. This will show which nutrients are present and where they are in the soil profile. It can also reveal whether there are any subsoil constraints, such as salinity or chloride.

Problems with subsoil constraints can vary from time to time due to soil wetting and drying cycles. Damaging levels of chloride and salinity in the subsoil have been prevalent – and problematic – due to the dry weather.

Some species are more susceptible to salts than others, so it is worth knowing if or how much the intended crop may be affected. The value of soil testing in these situations is priceless.

For more information on grain nutrient testing or soil testing, call Bede on 0417 896 377 or email bede.omara@incitecpivot.com.au ■

Grain testing is a quick and reliable way to analyse the nutrient removal from this year's under-performing summer crops.